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COMANDRA, GRAZING, AND COMANDRA BLISTER RUST

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INTERMOUNTAIN FOREST & RANGE EXPERIMENT STATION
FOREST SERVICE
U. S. DEPARTMENT OF AGRICULTURE
OGDEN, UTAH

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COMANDRA, GRAZING, AND COMANDRA BLISTER RUST

W. A. Laycock and R. G. Krebill [1]

Comandra (Comandra umbellata (L.) Nutt. ssp. pallida (A. DC.) Piehl) is a minor range plant and not very important in terms of forage or as a competitor of more desirable plants. Comandra is important, however, as a host for the sporophytic stage of Cronartium comandrae Pk., a rust fungus that kills hard pines. In the Rocky Mountains, comandra blister rust causes widespread damage to lodgepole pine (Krebill 1965) and local damage to ponderosa pine. Pines are infected by spores originating on comandra in adjacent or interspersed rangelands. Since comandra is a common plant on rangelands, and since it may influence the epidemiology of comandra blister rust disease, information on conditions that tend to increase or decrease the abundance of comandra may be useful to land managers.

Comandra, also known as bastard toadflax, is a perennial rhizomatous forb occurring in many range types. It is commonly found on dry open sites such as exposed slopes and rocky outcrops in sagebrush rangelands. However, it is sometimes found in fairly dense stands of sagebrush or grass on deeper soils and occasionally in the understory of open stands of ponderosa pine or other widely spaced trees. It is apparently not shade tolerant, since it is not found within dense lodgepole, spruce, or fir stands. Although parasitism is not absolutely necessary for its survival, comandra is more vigorous when it is attached to roots of associated plants (Piehl 1965).

In both range and forest management, comandra has been classified as an undesirable plant species which increases on or invades overgrazed ranges. For example, Julander (1937) indicated that comandra had "zero" palatability for sheep, cattle, and deer on the Kaibab National Forest in Arizona. The U.S. Forest Service (1961) has consistently listed comandra as an "invader," that is, a "non-climax species characteristic of disturbed areas" and "low in the scale of plant succession."

Mielke (1957, 1961) and Kimmey (1958) suggested that increases in comandra caused by overgrazing might have triggered recent severe outbreaks of comandra blister rust of lodgepole pine in the Rocky Mountains. This theory was based on the scarcity of known severe outbreaks of comandra blister rust in lodgepole pine prior to the 1950's, and also on the assumption that comandra had increased following the introduction of livestock on western ranges. For the most part this idea has remained untested because of a lack of firmly based ecological evidence.

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[1] The authors gratefully acknowledge special assistance from Dr. James L. Mielke, Pathologist, formerly with the Intermountain Forest and Range Experiment Station.

This report brings together various published and unpublished records [2] of the palatability and use of comandra by livestock and big game, and of the effect of this grazing. We hope this evaluation will stimulate others to examine their records for information which might improve understanding of the ecology of this range plant.

PALATABILITY AND USE

LIVESTOCK

The assumption that comandra is unpalatable is not justified. Comandra is quite palatable to sheep. On the sagebrush-grass ranges at the U.S. Sheep Experiment Station near Dubois, Idaho, sheep eat as much as 90 percent of the comandra on ranges grazed in the spring. Comandra has been reported as a constituent of the diet of sheep on sagebrush-grass summer range areas in northern Utah (Cook et al. 1961) and in the Gravelly Mountains in southwestern Montana (Peek 1963).

Many forbs are relatively unpalatable to cattle, and comandra appears to be no exception. It was listed with species grazed lightly or not at all on short-grass plains in Canada (Clarke 1930) and on western wheatgrass range in Colorado (Hanson et al. 1931). The literature searched contained only one reference to use of comandra by cattle. On sagebrush-grass ranges in the Missouri River Breaks in central Montana, Mackie (1965) found small amounts of comandra in cattle rumens examined in the spring and summer of 1963. He also observed light use of comandra by cattle on ranges grazed in spring, summer, and fall.

BIG GAME

Both deer and antelope eat comandra. In the Missouri River Breaks in central Montana, Mackie (1965) found that deer used comandra on one-third of the sites examined on sagebrush-grass range grazed by deer in spring, summer, and fall. Some use during the same seasons was also observed in the ponderosa pine-juniper type and in the greasewood-sagebrush type. Mackie (1965) also found comandra in deer rumens.

In northern Utah, deer enclosed in small sagebrush-grass paddocks in early summer used 13 to 25 percent of the comandra present.[3] In May 1966 we observed heavy use of comandra (50 to 75 percent) by deer inside a livestock exclosure on sagebrush-oakbrush-juniper range in southern Utah.

On grass and sagebrush-grass ranges in central Montana, Cole (1956) and Cole and Wilkins (1958) found comandra in antelope rumens or observed use of comandra by antelope at all seasons of the year. However, comandra made up a greater proportion of the diet in the spring and summer than in fall or winter; 72 percent of the contents of one rumen from an antelope collected on a grassland range in the spring was comandra

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[2] All information not otherwise credited is based on unpublished file data of the Intermountain Forest and Range Experiment Station.

[3] Personal communication, Arthur D. Smith, Range Science Department, Utah State University, Logan, Utah.

(Cole and Wilkins 1958). On sagebrush-grass antelope range in Saskatchewan, Dirschl (1963) found that comandra made up 5 to 6 percent of the volume of forage in antelope rumens collected during the summer.

We found little information about the relative palatability of comandra to elk. Mackie (1965) reported "relatively intensive" use of comandra by elk in late spring but only minor use by late summer and fall in the Missouri River Breaks in central Montana.

EFFECTS OF USE BY LIVESTOCK AND BIG GAME

SHEEP

Reports indicate that overgrazing by sheep tends to reduce comandra rather than increase it. In northern California, Meinecke (1928) reported that destructive grazing by sheep was at least partly responsible for a considerable reduction in the comandra population in the Mount Lassen area. On sagebrush-grass ranges at the U.S. Sheep Experiment Station in Idaho, comandra becomes scarce on ranges grazed too heavily in the spring (Mueggler 1950). On ranges in good condition it remains a minor but important part of the vegetation. In one study at the Sheep Station, heavy spring grazing caused the range to deteriorate from good to poor condition and reduced production of comandra from 20 pounds per acre in 1950 to 1 pound in 1964.[4] On adjacent ranges kept in good condition by favorable grazing treatments or by complete protection from grazing, production of comandra remained about 20 pounds per acre.

In another area at the Sheep Station, protected from grazing since 1931, production of comandra has steadily increased, although fluctuations have occurred possibly as a result of climatic variations (table 1). On adjacent range grazed in spring and fall by sheep, production of comandra has remained quite low.

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[4] Laycock, William A. How heavy grazing and protection affect sagebrush-grass ranges. J. Range Manage. (In press.)

Table 1.--Influence of sheep grazing on production of comandra at the U.S. Sheep Experiment Station, 1936-1958

Treatment	Production of comandra						
	1936	1938	1940	1942	1949	1953	1958
	Pounds per acre, air dry						
Exclosure	1	3	4	7	22	11	7
Grazed	1	--	1	--	1	--	2

CATTLE

Reports on effects of use by cattle vary. Comandra might increase on some overgrazed cattle ranges because it is not readily eaten by cattle. On fescue grassland range near Stavely, Alberta, comandra is scarce on all areas but it tends to increase slightly under heavy summer grazing by cattle.[5] The trends of abundance of comandra on heavily grazed cattle ranges in other areas are poorly documented. For example, Lewis et al. (1956) list the response of comandra to cattle grazing on mixed grass plains in South Dakota as "uncertain."

BIG GAME

Elk use apparently has little effect on abundance of comandra. Jones (1964) compared cover of vegetation inside and outside nine exclosures on heavily grazed elk winter range in northwestern Wyoming. Five areas had greater cover of comandra inside the exclosure, two areas had greater cover in the area grazed by elk outside the exclosure, and two areas had the same amount of cover inside and outside. Average percentage ground cover of comandra in the nine areas was slightly higher in the exclosures (1.8 percent) than in the grazed areas (1.4 percent) but the percentage of total vegetative cover contributed by comandra was higher in the grazed areas. This probably indicates that heavy grazing by elk during the winter had little effect on comandra and relatively more effect on other species. This would result in the absolute amount of comandra remaining about constant while other species decreased. Nothing is known about the effect on comandra of use by elk in spring and summer.

Even though deer and antelope readily eat comandra, the effect of their use on abundance of comandra apparently has never been studied.

COMBINED USE BY MORE THAN ONE TYPE OF ANIMAL

On ranges grazed by two or more types of animals, comandra often decreases. This is especially true where sheep are grazed with other animals. In an area in Ephraim Canyon in central Utah, comandra shoots were counted at intervals from 1926 to 1966 on permanent, meter-square quadrats inside and outside an exclosure in a sagebrush-rabbitbrush-snowberry type. Heavy grazing by sheep, cattle, and deer outside the exclosure kept comandra at a relatively low level, but comandra increased markedly on the quadrats inside the exclosure protected from grazing by all types of animals (table 2).

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[5] Personal communication, Alexander Johnston, Can. Dep. Agr. Res. Sta., Lethbridge, Alberta.

Table 2.--Density of comandra as influenced by mixed grazing in Ephraim Canyon, 1926-1966

Treatment	Comandra shoots				
	1926	1938	1950	1958	1966
	Thousands per acre				
Exclosure	0	0	49	107	115
Grazed	1	3	8	4	4

On thin-soil prairie areas in Wisconsin, Dix (1959) found that comandra (subspecies umbellata) was at some disadvantage under grazed conditions. In 24 pairs of grazed and ungrazed sites, he found comandra in 11 ungrazed areas but in only three grazed areas. Grazing had been predominantly by cattle but also by sheep and horses in some sites.[6]

On sagebrush-oakbrush-juniper range in southern Utah, comandra was absent from permanent sample plots on range grazed by cattle and deer from 1932 to 1966 and remained at a low level on plots inside an exclosure closed to cattle but open to deer (table 3).

On ranges grazed by elk and cattle, the response of comandra is somewhat varied. In the Gros Ventre drainage of northwestern Wyoming, comandra shoots were counted in permanent plots inside and outside a new exclosure in 1956 and again in 1965. The area is along a cattle driveway and near an elk winter feeding area, so the outside plots probably received heavy use by both animals before and after the exclosure was established. Numbers of comandra shoots remained about the same inside the exclosure where both types of animals were prohibited but more than doubled on the grazed range (table 4).

In the same general area in northwestern Wyoming, Jones (1964) found more comandra inside exclosures than on adjacent range grazed by elk and cattle (two areas) and by elk and sheep (one area). These areas were sampled only once, however, and trends over time are not known.

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[6] Personal communication, Ralph Dix, Department of Plant Ecology, University of Saskatchewan, Saskatoon, Saskatchewan.

Table 3.--Comandra frequency[1] and production as influenced by cattle and deer grazing near Kanosh, Utah, 1932-1966

Treatment	Frequency of occurrence			Average production per acre, air dry	
	1932	1942	1966	1942	1966
	Percent			Pounds	
Exclosure[2]	4	9	3	3.9	1.3
Grazed	0	0	0	0	0

[1] Based on data for 100 plots, each covering 100 square feet.
[2] Open to deer use.

Table 4.--Influence of heavy elk and cattle use on density of comandra near Jackson, Wyoming

Year	Comandra shoots			
	Ungrazed exclosure	Plots grazed by elk and cattle		
		1	2	3
	Thousands per acre			
1956	121	34	28	40
1965	127	74	54	112

DISCUSSION

The evidence presented indicates that comandra neither increases on nor invades most overgrazed ranges. Comandra decreases on ranges grazed heavily by sheep, either alone or in combination with other animals. On these ranges, comandra should be classified as a "decreaser" in range condition criteria and not an "increaser" or "invader."

Comandra is not consistently influenced by heavy use by other animals. Because it is not readily eaten by cattle, comandra could increase on overgrazed cattle range when selective grazing pressure causes the more palatable species to decrease. The evidence of comandra response to cattle grazing is conflicting, however, and no clear-cut pattern is apparent.

Since overgrazing probably has not caused comandra to increase on most ranges, there seems to be no relationship between grazing and the current prevalence of comandra blister rust in lodgepole pine. Furthermore, moderate increases or decreases in abundance of comandra may not influence the incidence of rust infection in pine. Since even one comandra shoot produces large numbers of pine-infecting spores (numerous counts suggest 1.5 million under favorable conditions), relatively small populations of comandra in the vicinity of pine stands might furnish enough spores for abundant infection in years with favorable climatic conditions.

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